DOCUMENT RESUME

ED 208 762 HE 014 483

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TITLE Development of Higher Education Product-Value Indexes.
INSTITUTION American Institutes for Research in the Behavioral Sciences, Palo Alto, Calif.
SPONS AGENCY National Center for Education Statistics (ED), Washington, D.C.
REPORT NO AIR-87500-9-81-TR; SAGE-TR-23
PUB DATE Sep 81
CONTRACT 300-80-0823
NOTE 48p.; For related document see HE 014 463.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *College Programs; Comparative Analysis; Degrees (Academic); Departments; *Economic Factors; Educational Benefits; Educational Finance; *Education Work Relationship; Employment Potential; *Evaluation Criteria; Higher Education; Indexes; *Institutional Characteristics; Majors (Students); Private Colleges; *Program Evaluation; Retrenchment; Salaries; State Colleges; Trend Analysis; Two Year Colleges
IDENTIFIERS *Institutional Vitality

ABSTRACT

To examine the relative attractiveness of program offerings for different types of higher education institutions and the relation of these offerings to the viability of the institutions, three data sources were used to derive eight composite indexes describing the market values of degrees awarded by colleges and universities. The indexes, termed Higher Education Product-Value Indexes (HEPVI), describe the program offerings and changes in program offerings over time for schools in six institutional sectors and 18 National Center for Higher Education Management Systems institutional classifications. Several of these measures are shown to be significantly correlated with the levels of distress experienced by higher education institutions in three of the six sectors. The principal data sources were the Higher Education General Information Survey (HEGIS), the "Occupational Outlook Handbook," published by the U.S. Department of Labor, and the annual surveys of starting salary offers made to recent graduates conducted by the College Placement Council. The eight indexes calculated for each institution were weighted by the proportion of degrees awarded by the institution at the various levels in each field. For research purposes, the HEPVI measures serve as first-approximation indicators allowing, for example, the examination of the relationship between program offerings at institutions and the financial health of these institutions. The HEPVI estimates are not suitable for evaluating or ranking individual institutions. Additional details and data relevant to the construction of the indexes are appended. (SW)

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ED208762

Technical Report No. 23

Development of Higher Education Product-Value Indexes

Robert J. Rossi

Prepared by

SAGE
STATISTICAL ANALYSIS GROUP IN EDUCATION

For the

National Center for Education Statistics

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HE 014 483

AIR-87500-9/81-TR

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Development of Higher Education Product-Value Indexes

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This work was done under Contract No. 300-80-0823 with the National Center for Education Statistics, Department of Education. The content does not necessarily reflect the position or policy of either agency, however, and no official endorsement should be inferred.

September 1981

SUMMARY

Sage Technical Report No. 17, Workplans for Developing Educational Indicators, called for the development of first-approximation product-value indexes for public and private colleges and universities. These indexes were to be used to examine the relative attractiveness of program offerings to students and the relation of program offerings to the viability of the institutions themselves. Eight composite indexes describing the market values of degrees awarded by colleges and universities, termed Higher Education Product-Value Indexes (HEPVI), were developed and are presented in this technical report. These measures are used to describe the program offerings and changes in program offerings over time for schools in six institutional sectors and 17 National Center for Higher Education Management Systems (NCHEMS) institutional classifications. Several of these measures are also shown to be significantly correlated with the levels of distress experienced by higher education institutions in three of the six sectors. A technical appendix is attached and presents additional details and data relevant to the construction of these indexes. The principal data sources used in this study were the Higher Education General Information Survey (HEGIS), the Occupational Outlook Handbook, published by the U.S. Department of Labor, and the annual surveys of starting-salary offers made to recent graduates conducted by the College Placement Council.

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Development of Higher Education Product-Value Indexes

Along with providing opportunities for advanced learning, higher education institutions train and certify students for occupations. These job-related functions have taken on special significance in recent years. More and more students are selecting colleges and universities to attend based on the availability of major fields of study and degrees that can lead to well-paying jobs following graduation. A February 1974 article in the Chronicle of Higher Education, for example, called the shift from theoretical, abstract, and purely academic fields to majors that relate more directly to jobs the "most notable trend among college students of the 1970s."

Appreciation of this trend must figure importantly in the planning and decisionmaking of administrators of higher education institutions. Colleges and universities, especially private institutions, depend to some extent on the willingness of students to pay tuition and fee charges. With the reductions in direct and indirect federal supports to higher education that may occur during the next few years, colleges will be relying on the willingness of students to support an even larger share of the costs of higher education. Because schools offering degrees in fields that pay well (e.g., business) will be in stronger positions to charge higher tuition rates and still attract sufficient numbers of applicants, shifts in the program offerings of higher education institutions to more profitable, work-related majors may be necessary for institutional survival.

To examine the relative attractiveness of program offerings for different types of higher education institutions and the relation of these offerings to the viability of the institutions, three data sources were used to derive eight composite indexes describing the market values of degrees awarded by colleges and universities. Higher Education General Information Survey (HEGIS) data provided the numbers of degrees awarded by colleges and universities at the associate, bachelor's, master's, doctoral, and first-professional levels in 67 major fields. This survey also provided estimates

of the numbers of students and faculty at each institution and the amounts and types of institutional revenues and expenditures. (Revenue and expenditure estimates were subsequently converted into constant 1978 dollars using the Higher Education Price Index.) The market values of the degrees at each level in the 67 fields were derived from starting-salary estimates provided by the 1980 Occupational Outlook Handbook, published by the U.S. Department of Labor, and the 1980 surveys of starting-salary offers to graduates conducted annually by the College Placement Council.* (Market values of degree awards were therefore expressed in 1980 dollars, and these constant dollar estimates were used in the analyses of 1976-1978 index values.) The derived starting-salary estimates for graduates at various levels in the 67 fields are presented in Table A-3 in the Appendix.

The eight indexes calculated for each institution were weighted by the proportion of degrees awarded by the institution at the various levels in each field. These measures, termed Higher Education Product-Value Indexes (HEPVI), are defined below along with notes on their interpretation. Technical details associated with the refinements of data sources for these indexes are contained in the appendix.

- Total HEPVI--sum of the values of all degrees awarded in a given year--will be higher for (larger) schools that award many degrees.
- Mean HEPVI--ratio of Total HEPVI to the total number of degree awards--will be higher for schools that award proportionally more degrees with high market values.

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* The College Placement Council (CPC) Salary Surveys, which provide starting-salary data and have been conducted for over 20 years, are based on a representative sample of 161 colleges and universities whose graduates' starting salary offers are obtained from the 184 placement offices serving the schools and from the graduates themselves via self-reporting. Data from both the June and special, summer CPC Salary Surveys were used in developing HEPVI measures. Occupational Outlook Handbook salary estimates are based on surveys conducted by the Department of Labor in various occupational areas, reports issued by professional associations, and earnings paid to workers in the same and related fields by U.S. Government agencies.

- Student HEPVI--ratio of Total HEPVI to the total full-time equivalent (FTE) student enrollment--will be higher for schools with low student attrition rates prior to degree award, especially schools awarding proportionally more high-value degrees and two-year institutions.

- Tuition Rate HEPVI--Mean HEPVI divided by the ratio of total tuition revenues to total FTE student enrollment--will be higher for schools that award a greater proportion of degrees with high market values or charge lower tuition per FTE student. This index would normally be higher for public than private colleges.

- Faculty HEPVI--ratio of Total HEPVI to the total number of full-time faculty members employed--will be higher for schools that award many degrees relative to the number of full-time faculty, as would be true of many two-year colleges employing a high proportion of part-time faculty.

- Instructional HEPVI--ratio of Total HEPVI to total institutional expenditures for instruction--will be higher for schools that award many degrees of high value relative to their instructional expenses.

- Educational and General HEPVI--ratio of Total HEPVI to total institutional expenditures, excepting auxiliary and independent expenditures (e.g., food service contracts)--will, as in the case of the previous indicator, be higher for schools that are efficient in their operations. In this case, the measure will be higher for schools that award many degrees of high value relative to their institutional operating expenditures.

- Net Tuition HEPVI--ratio of Total HEPVI to total tuition revenues minus expenditures for student scholarships and loans--will be higher for schools that have major sources of support other than tuition revenues. Schools that can rely on returns from large endowments or federal subsidies to meet operating expenses, for example, would be in stronger positions to charge lower tuition rates or provide many student scholarships and loans.

For each HEPVI, index values for colleges were calculated for single years and for the changes in values from one year to another. In the case of Total HEPVI, only the change form of the indicator, computed as the percentage change in the index from one year to another, was used in analysis. In this form, the index is not biased by the institutional capacity to award many degrees.

Table 1 presents the medians and interquartile ranges of the 1978 values of the eight composite indexes.* Calculated for all higher education institutions included in HEGIS in 1978 (3,125 schools), the index values are disaggregated by six institutional sectors: public versus private universities, public versus private four-year colleges, and public versus private two-year colleges. Table 2 presents similar disaggregations for the change in values of these composite measures between 1976 and 1978. Tables A-1 and A-2 in the appendix present the median and interquartile ranges for single-year and change HEPVI values disaggregated by National Center for Higher Education Management Systems (NCHEMS) institutional classifications.

Product Values for Different Types of Institutions

Professional schools and public and private universities report higher values for Mean HEPVI, Student HEPVI, Faculty HEPVI, Educational and General HEPVI, and Instructional HEPVI than other specialized schools and schools in other sectors (see, for example, Figures 1, 2, and 4, beginning on page 9). This meets with expectations, suggesting that professional schools and universities: (1) award proportionally more high-value degrees (e.g., degrees beyond the B.A.), (2) have lower student attrition rates, and (3) are more efficient--producing greater numbers of degree awards with lower investments of faculty time and either instructional expenditures, or educational and general expenditures. Medical schools provide an exception in the case of Instructional HEPVI, suggesting that unlike other professional schools they cannot avoid high costs for equipment and materials used in instruction (Figure 4). Professional schools, universities, and four-year colleges seem to have shifted course offerings somewhat

* Following a convention frequently used with fiscal or school years, a year is referred to by the calendar year in which it terminated. Thus, data collected during the 1977-78 school year are labeled as 1978 data, even if they were collected in 1977.

Table 1

Medians (M) and Interquartile Ranges (R) for HEPVI Values in 1978, by Institutional Sector

Institutional Sector	Total* HEPVI		Mean* HEPVI		Student* HEPVI		Tuition Rate HEPVI		Faculty* HEPVI		Instructional HEPVI		E&G HEPVI		Net Tuition HEPVI	
	M	R	M	R	M	R	M	R	M	R	M	R	M	R	M	R
University																
Public	$63,688 (N=89)	$44,597	$15.7 (N=89)	$1.3	$3.7 (N=89)	$.7	18.9 (N=89)	10.3	$74.4 (N=29)	$27.8	1.7 (N=89)	.6	.7 (N=89)	.2	5.2 (N=89)	3.3
Private	$34,893 (N=68)	$30,012	$17.3 (N=68)	$2.1	$4.7 (N=68)	$1.1	5.0 (N=67)	1.6	$95.3 (N=27)	$38.1	1.7 (N=68)	1.3	.8 (N=68)	.6	1.8 (N=67)	.6
4-Year College																
Public	$11,503 (N=227)	$14,029	$13.8 (N=227)	$1.7	$3.0 (N=227)	$1.1	22.2 (N=219)	12.5	$59.0 (N=210)	$26.9	2.1 (N=226)	.9	1.0 (N=227)	.5	5.5 (N=219)	4.4
Private	$2,079 (N=1218)	$3,530	$13.1 (N=1217)	$3.1	$2.9 (N=1217)	$1.5	5.8 (N=1208)	2.6	$48.0 (N=1111)	$34.1	1.9 (N=1217)	1.3	.7 (N=1217)	.5	1.5 (N=1210)	1.1
2-Year College																
Public	$1,128 (N=607)	$1,835	$8.0 (N=528)	$.4	$.7 (N=606)	$.7	22.5 (N=525)	21.1	$17.4 (N=601)	$19.2	.6 (N=607)	.7	.3 (N=607)	.3	2.1 (N=604)	3.5
Private	$634 (N=219)	$894	$8.1 (N=200)	$1.8	$1.9 (N=219)	$1.4	5.7 (N=200)	2.9	$44.5 (N=200)	$46.8	2.2 (N=219)	1.9	.7 (N=219)	.7	1.4 (N=219)	1.2

* Values reported in thousands of dollars.

Table 2

Medians (M) and Interquartile Ranges (R) for Changes in HEPVI Values from 1976 to 1978, by Institutional Sector

Institutional Sector	Total* HEPVI		Mean** HEPVI		Student** HEPVI		Tuition Rate HEPVI		Faculty** HEPVI		Instructional HEPVI		E&G HEPVI		Net Tuition HEPVI	
	M	R	M	R	M	R	M	R	M	R	M	R	M	R	M	R
University																
Public	+8.0% (N=89)	13.1%	+$.2 (N=89)	$.2	+$.2 (N=89)	$.5	-.2 (N=89)	2.6	+$5.7 (N=28)	$14.9	+.1 (N=89)	.3	±0.0 (N=89)	.1	+.2 (N=89)	1.1
Private	+14.4% (N=68)	14.4%	+$.1 (N=68)	$.5	+$.4 (N=68)	$.8	-.2 (N=67)	.3	+$11.2 (N=25)	$20.8	+.1 (N=68)	.3	±0.0 (N=68)	.1	+.1 (N=67)	.3
4-Year College																
Public	+10.4% (N=223)	21.9%	+$.2 (N=223)	$.5	+$.3 (N=223)	$.6	±0.0 (N=216)	4.0	+$5.4 (N=202)	$13.1	+.1 (N=222)	.5	±0.0 (N=223)	.2	+.3 (N=216)	2.1
Private	+11.8% (N=1179)	38.8%	+$.1 (N=1179)	$.6	+$.2 (N=1179)	$.9	-.1 (N=1167)	.8	+$3.4 (N=1025)	$16.5	+.2 (N=1172)	.6	±0.0 (N=1175)	.3	+.1 (N=1167)	.6
2-Year College																
Public	+12.1% (N=513)	50.9%	±$0.0 (N=503)	$.1	±$0.0 (N=585)	$.2	-.7 (N=498)	6.5	+$.1 (N=578)	$6.9	±0.0 (N=586)	.3	±0.0 (N=586)	.1	±0.0 (N=581)	1.3
Private	+16.9% (N=172)	71.6%	±$0.0 (N=169)	$0.0	+$.3 (N=192)	$.7	-.1 (N=169)	.9	+$3.6 (N=162)	$23.1	+.2 (N=192)	1.0	+.1 (N=192)	.3	+.2 (N=192)	.8

* The change in Total HEPVI from 1976 to 1978 is calculated as the percentage change in the index over this period.

** Values reported in thousands of dollars.

to higher-paying specialties, as these schools report marked constant-dollar increases in Mean HEPVI for the period studied (Figure 6). Two-year colleges, in contrast, report little change in Mean HEPVI during this period, probably due to the fact that no degrees beyond the A.A. are awarded by these institutions and the market values of A.A. degrees do not vary greatly (e.g., as compared to the differences between B.A. degrees in education versus engineering). Universities and professional schools (excepting medical schools) also seem to have taken the lead in increasing efficiency, as the 1976-1978 change forms of Faculty HEPVI and Instructional HEPVI show the largest increases for these schools (Figures 7 and 9).

Values for Tuition Rate HEPVI and Net Tuition HEPVI demonstrate two virtues of being a public higher education institution. First, tuition rates can be lower in relation to the potential values of degrees awarded (Figure 3). Second, net tuition revenues (i.e., revenues from tuition charges minus expenditures for student scholarships and loans) can be lower in relation to the market values of degree awards, suggesting that public universities and four-year colleges may need to depend less than their private counterparts on net tuition revenues in meeting the costs associated with awarding higher-value undergraduate degrees (e.g., engineering degrees) and degrees beyond the B.A. Little change occurred during the period 1976-1978, although both public and private universities and some professional schools may have increased the ratio of tuition revenues per student slightly during the period. (Figure 8 shows the slight declines in the median value of Tuition Rate HEPVI for these schools while Figure 6 shows that their Mean HEPVI values may have actually increased during this period.) Universities and four-year colleges also apparently were able to award greater numbers of degrees in 1978 than in 1976 (see the increases in Total HEPVI for these schools in Table 2) while realizing proportionately less net tuition revenue in 1978 (Figure 10).

Finally, public two-year colleges, in reporting the lowest Student HEPVI values, attest to their continuing status as largely part-time institutions many of whose students either fail to receive degrees or, if they do complete work after a period of years, are awarded degrees in

fields that initially pay less. The many students enrolled in public two-year colleges who may be less interested in earning degrees than in pursuing avocational interests seem to negatively affect HEPVI measures of the efficiency of these institutions. Two-year public colleges must employ large faculties and spend considerable sums on instruction to provide the diversity in curricula demanded by students, despite the fact that of the many enrolled, few will earn degrees. Faculty HEPVI, Instructional HEPVI, and Educational and General HEPVI all are lower for two-year public colleges than for private two-year colleges and for either universities or four-year colleges (see for example, Figures 2 and 4). The changes in these indexes from 1976 to 1978 suggest that public two-year schools lagged behind all other institutions in increasing the numbers of degree awards relative to either the size of their faculties or their budgets for instruction (Figures 7 and 9), although tuition revenues per student increased in relation to the mean value of the degrees awarded at these institutions.

Figures 1-5 present the medians and interquartile ranges for selected HEPVI measures disaggregated by institutional sector and selected NCHEMS classifications. Figures 6-10 present similarly disaggregated values for the changes in value of these indicators from 1976 to 1978. The indexes and NCHEMS classifications presented in these figures were chosen to highlight some of the more striking differences between the different types of higher education institutions. (Values of the eight HEPVI indexes for all NCHEMS classifications are, as noted earlier, presented in Tables A-1 and A-2 in the appendix.)

Product Values and Institutional Viability

In a recent report entitled Development of Indicators of the Viability of Higher Education Institutions (Kevin J. Gilmartin, 1981, Technical Report No. 19 of the Statistical Analysis Group in Education, National Center for Education Statistics), a composite index of institutional distress was presented. More specifically, distress scores (DSCORES) were derived and validated for universities and colleges in three institutional sectors: private four-year colleges, private two-year

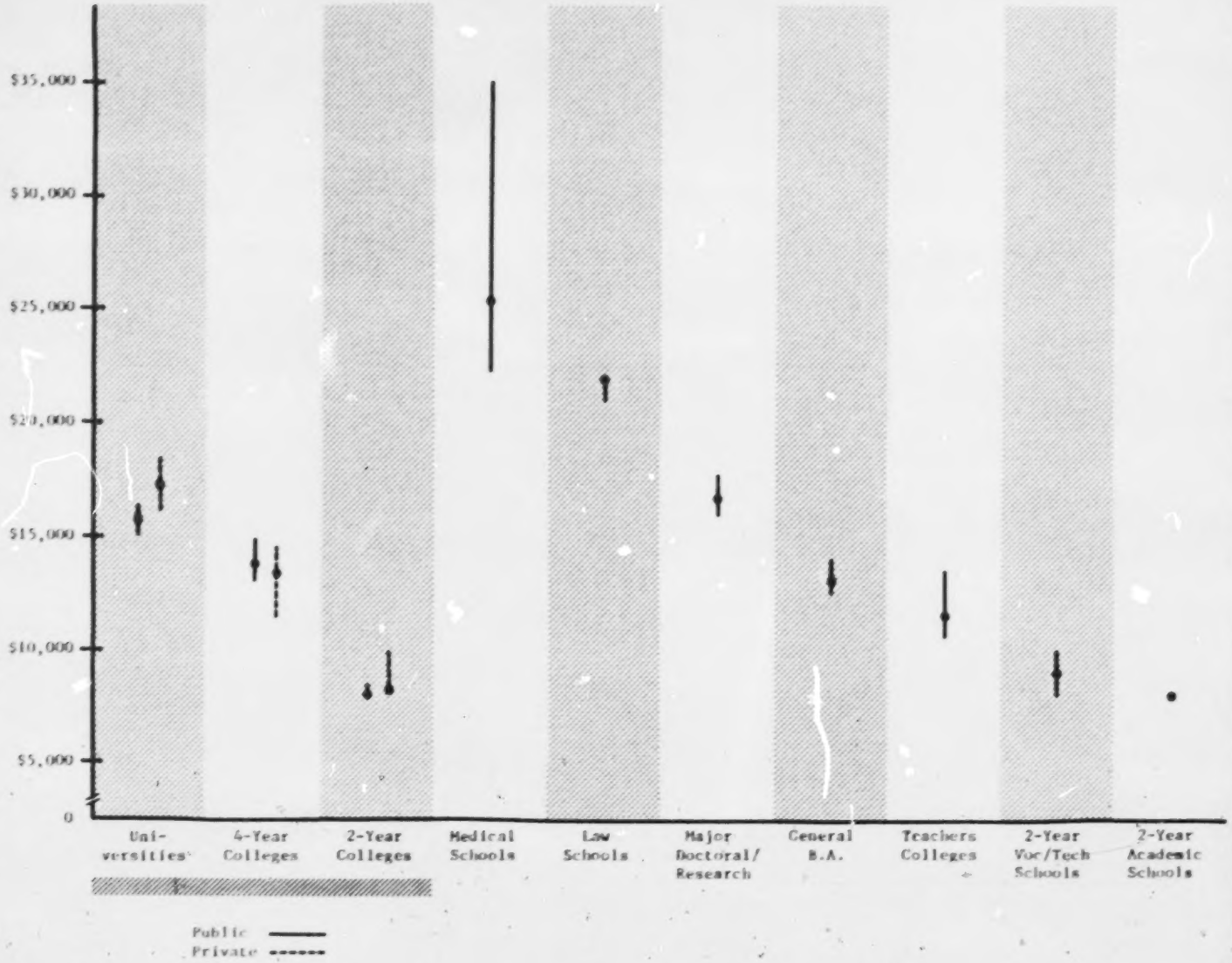

Figure 1. Mean HEPVI values in 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

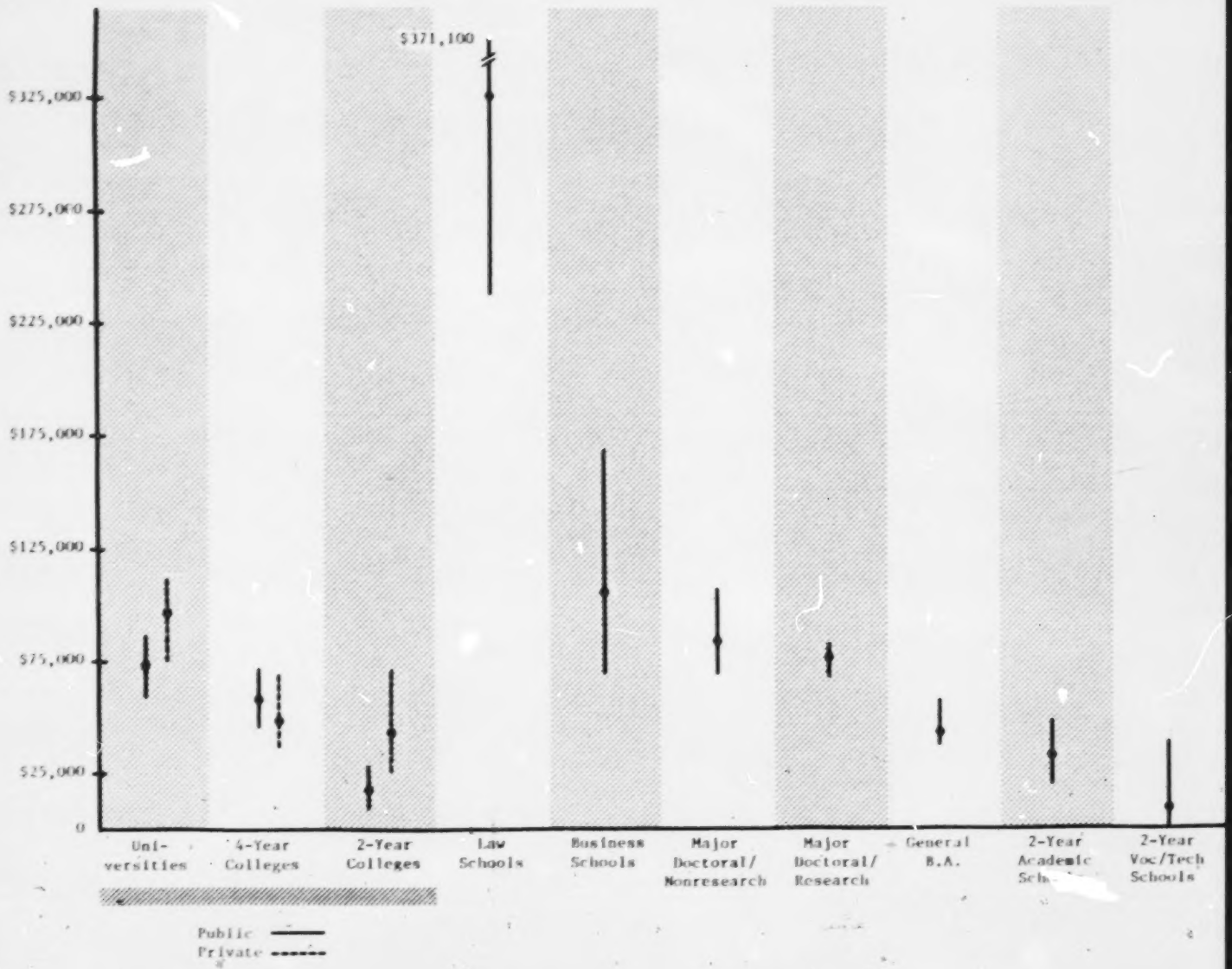

Figure 2. Faculty HEPVI values in 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

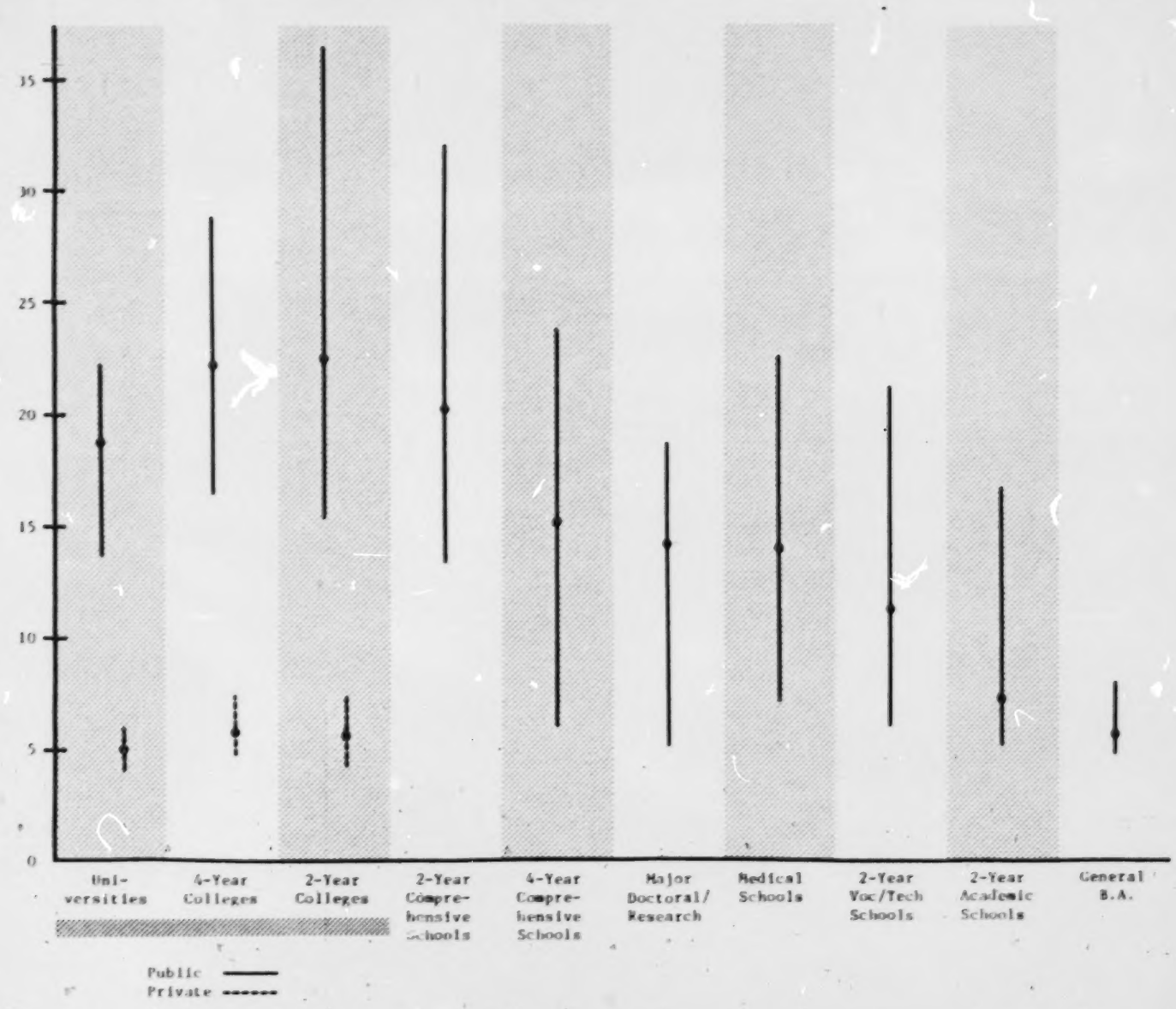

Figure 3. Tuition Rate HEPVI values in 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

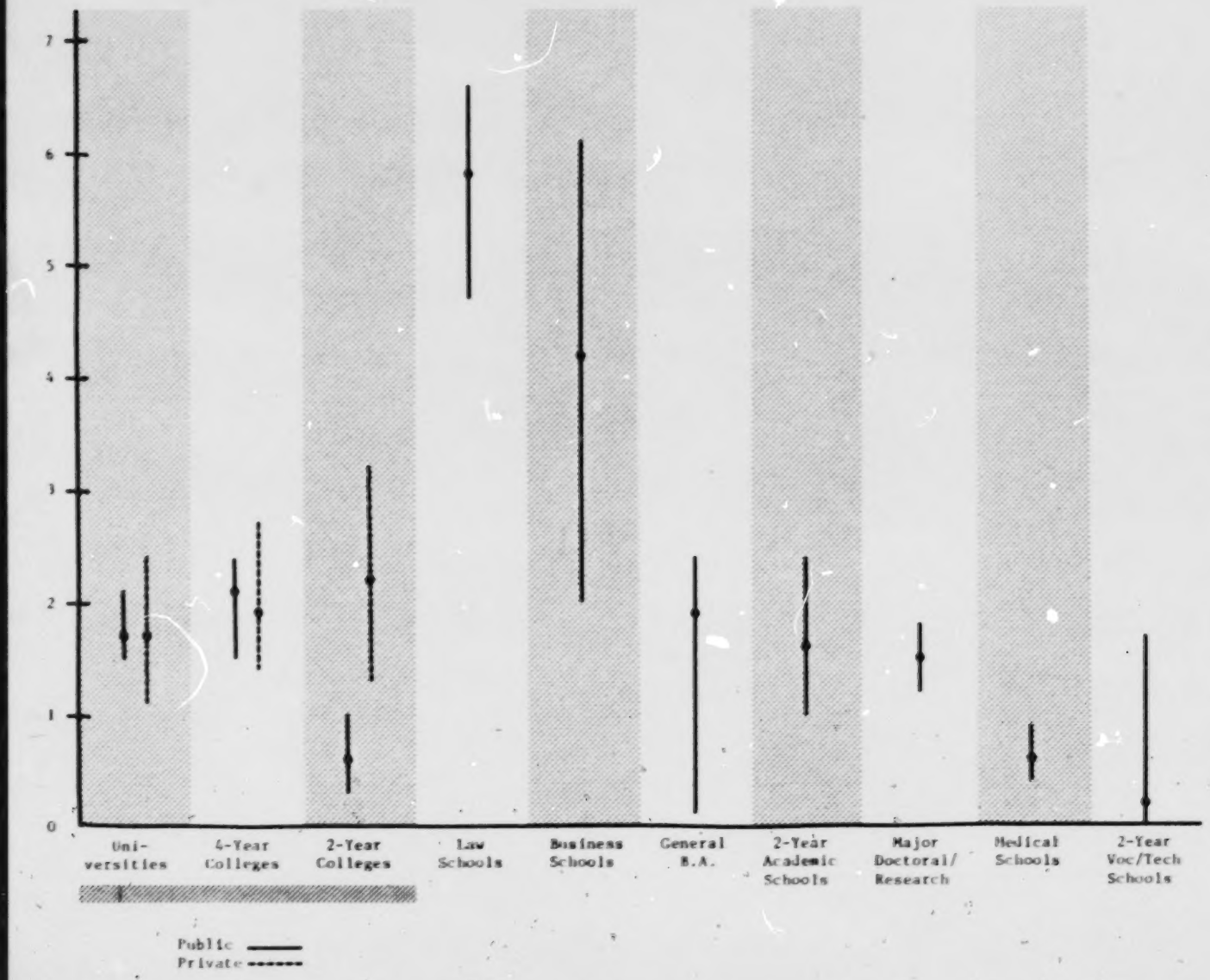

Figure 4. Instructional HEPVI values in 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

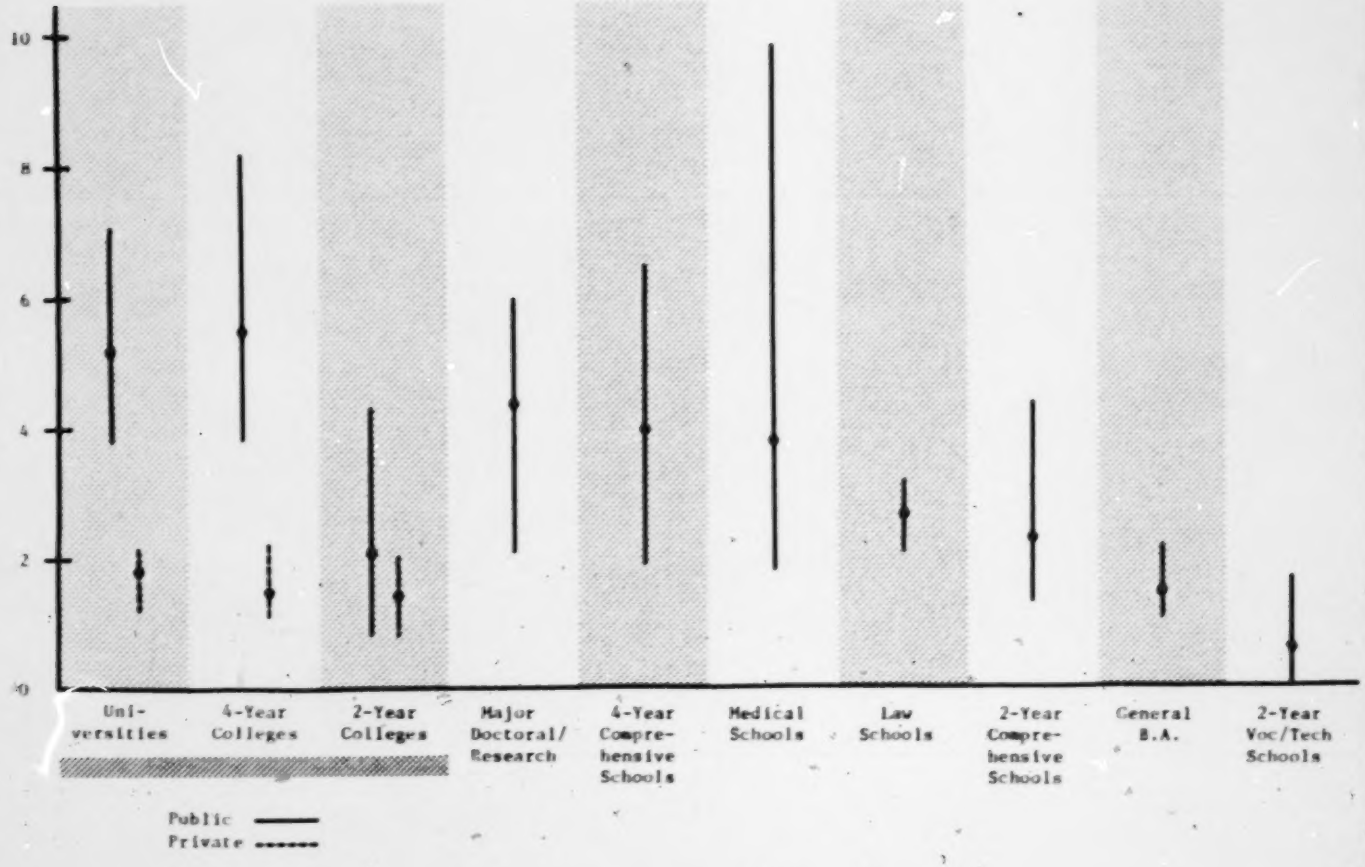

Figure 5. Net Tuition HEPVI values in 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

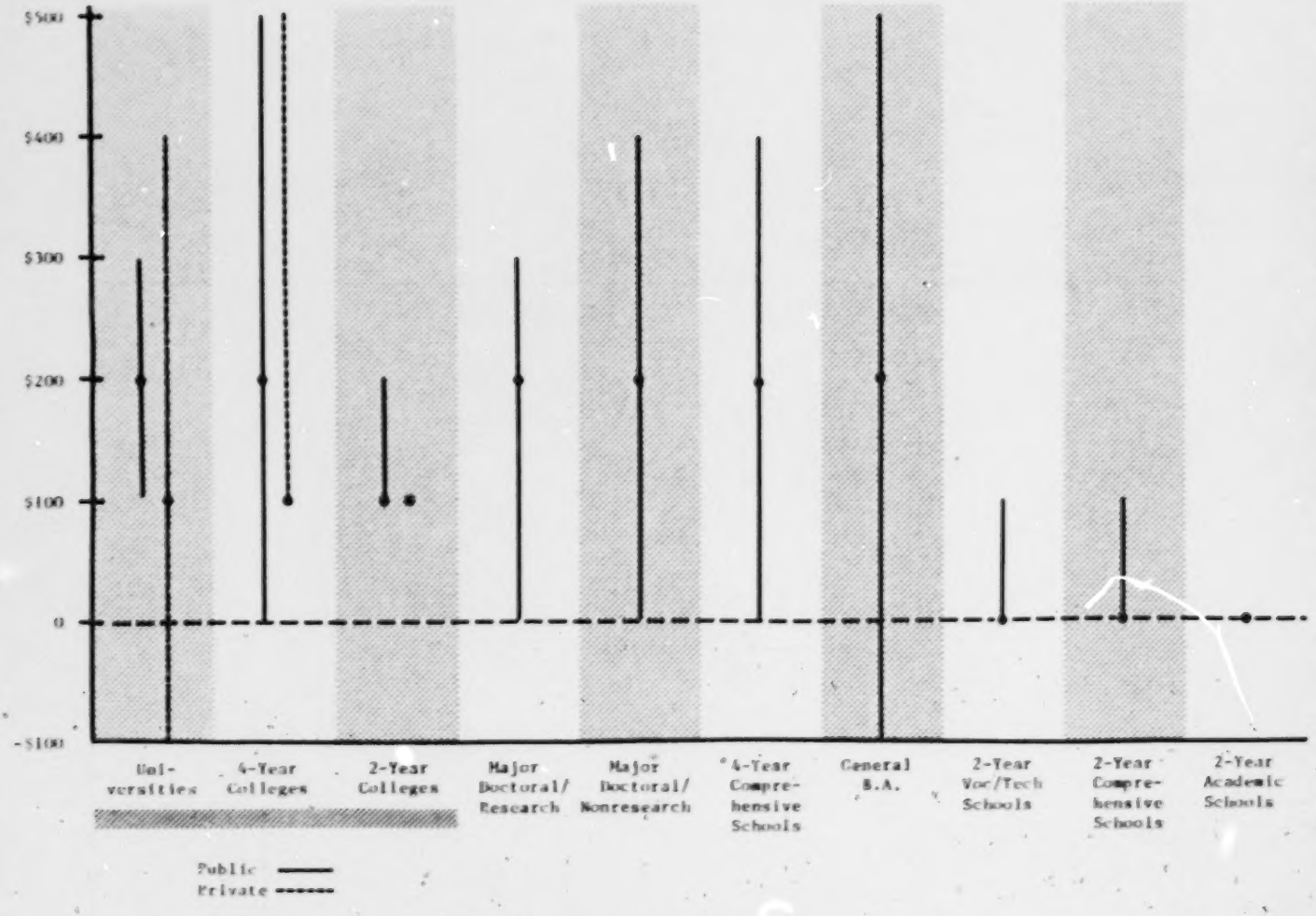

Figure 6. Changes in Mean HEPVI values from 1976 to 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

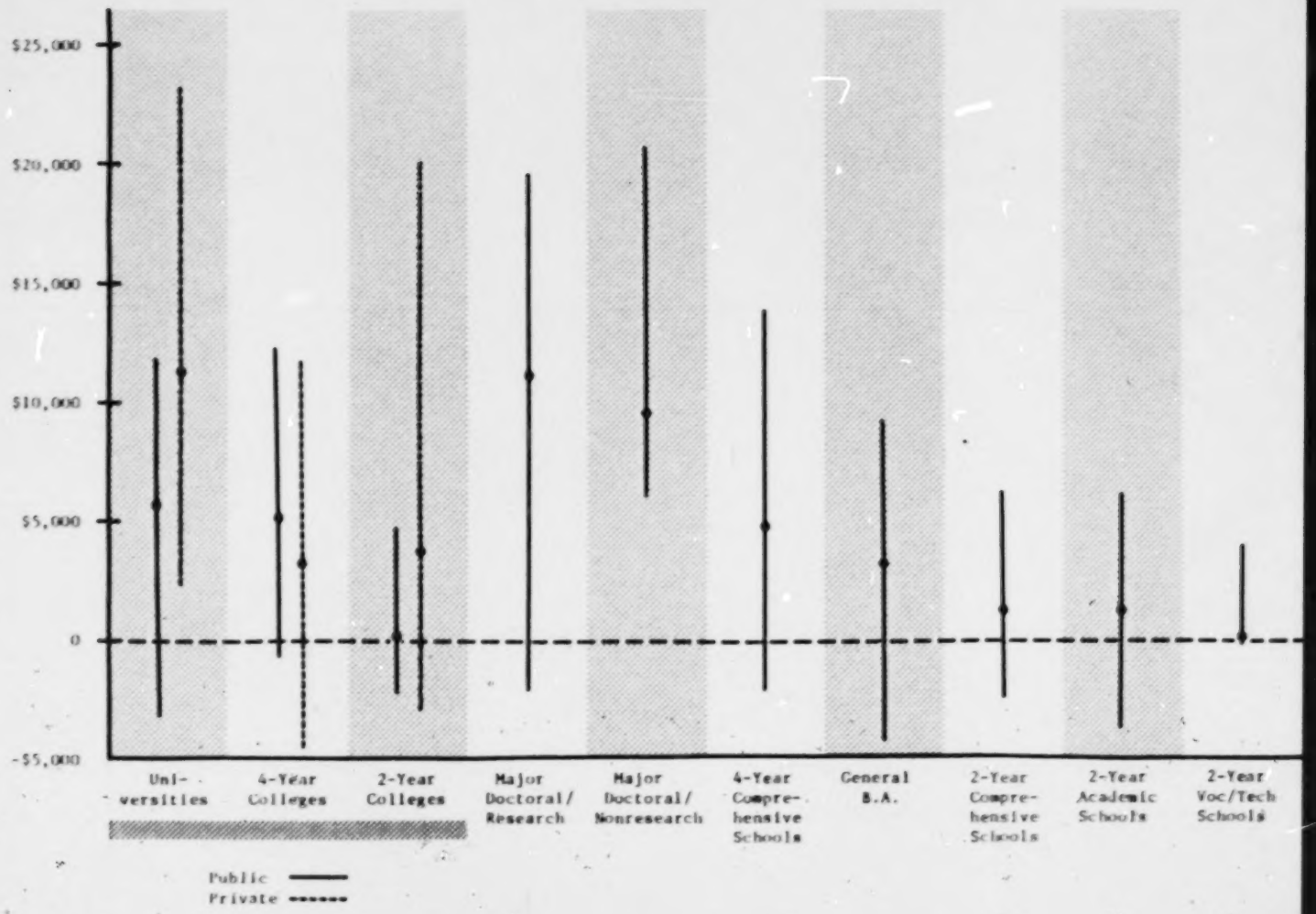

Figure 7. Changes in Faculty HEPVI values from 1976 to 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

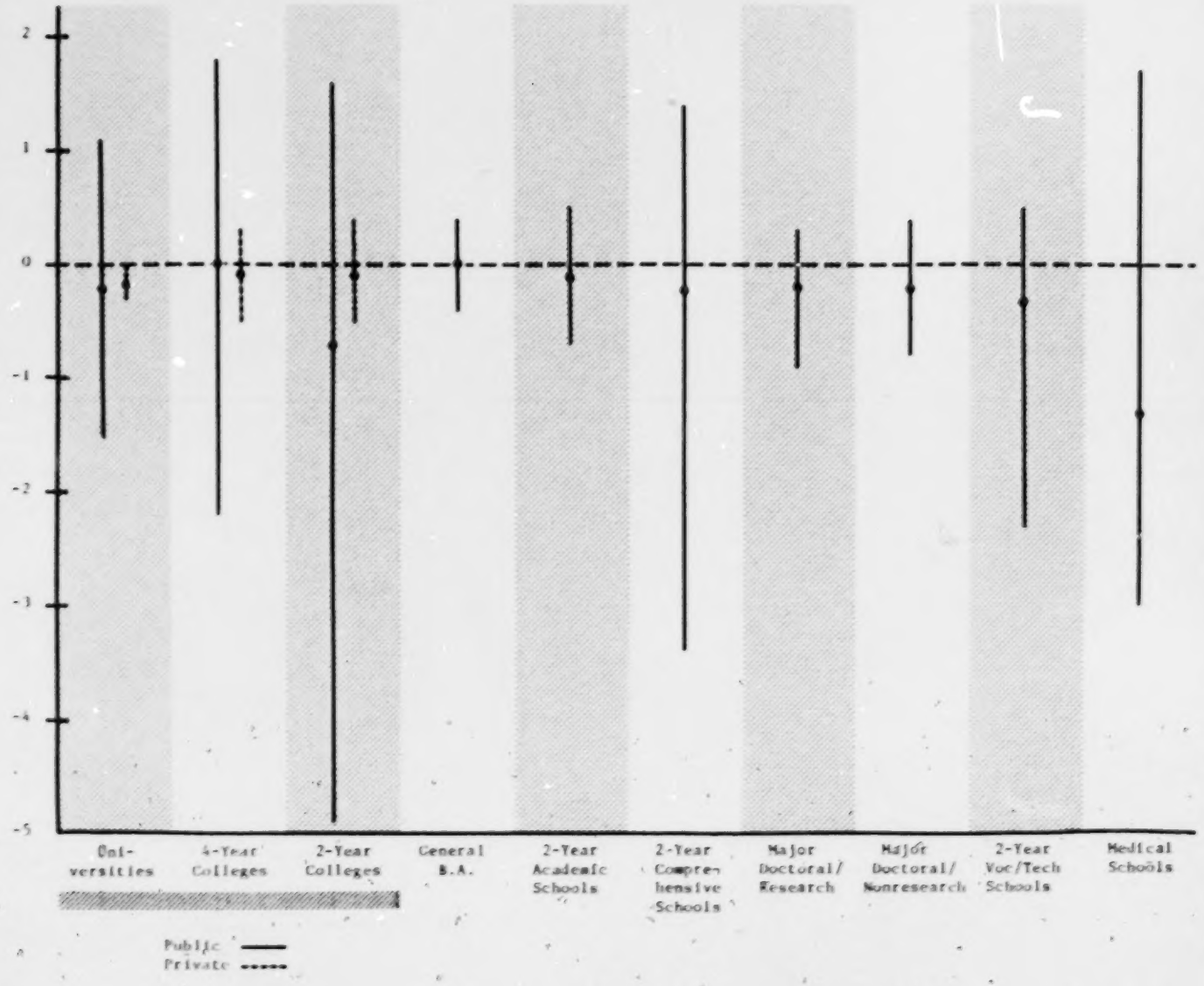

Figure 8. Changes in Tuition Rate HEPVI values from 1976 to 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

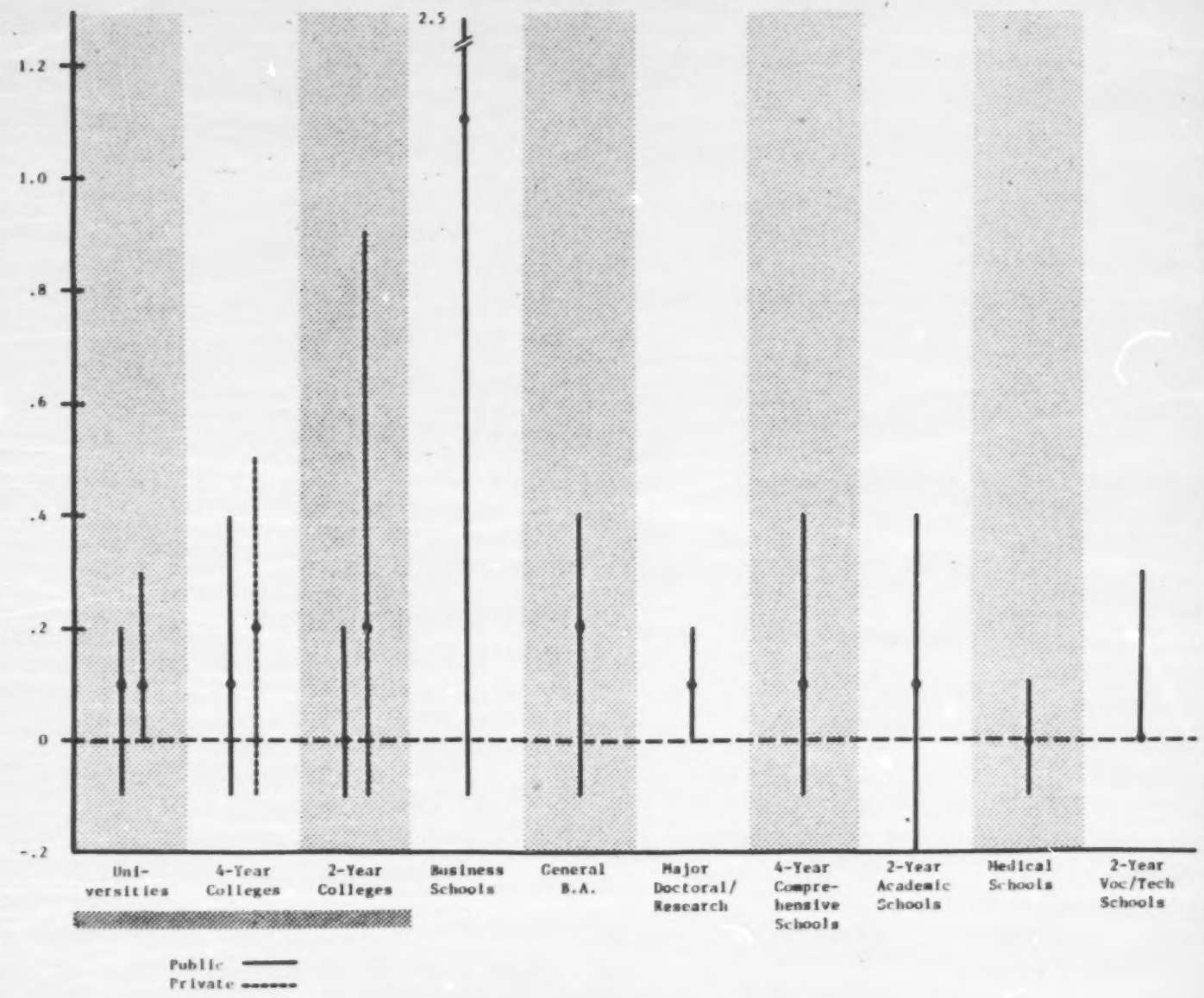

Figure 9. Changes in Instructional HEPVI values from 1976 to 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

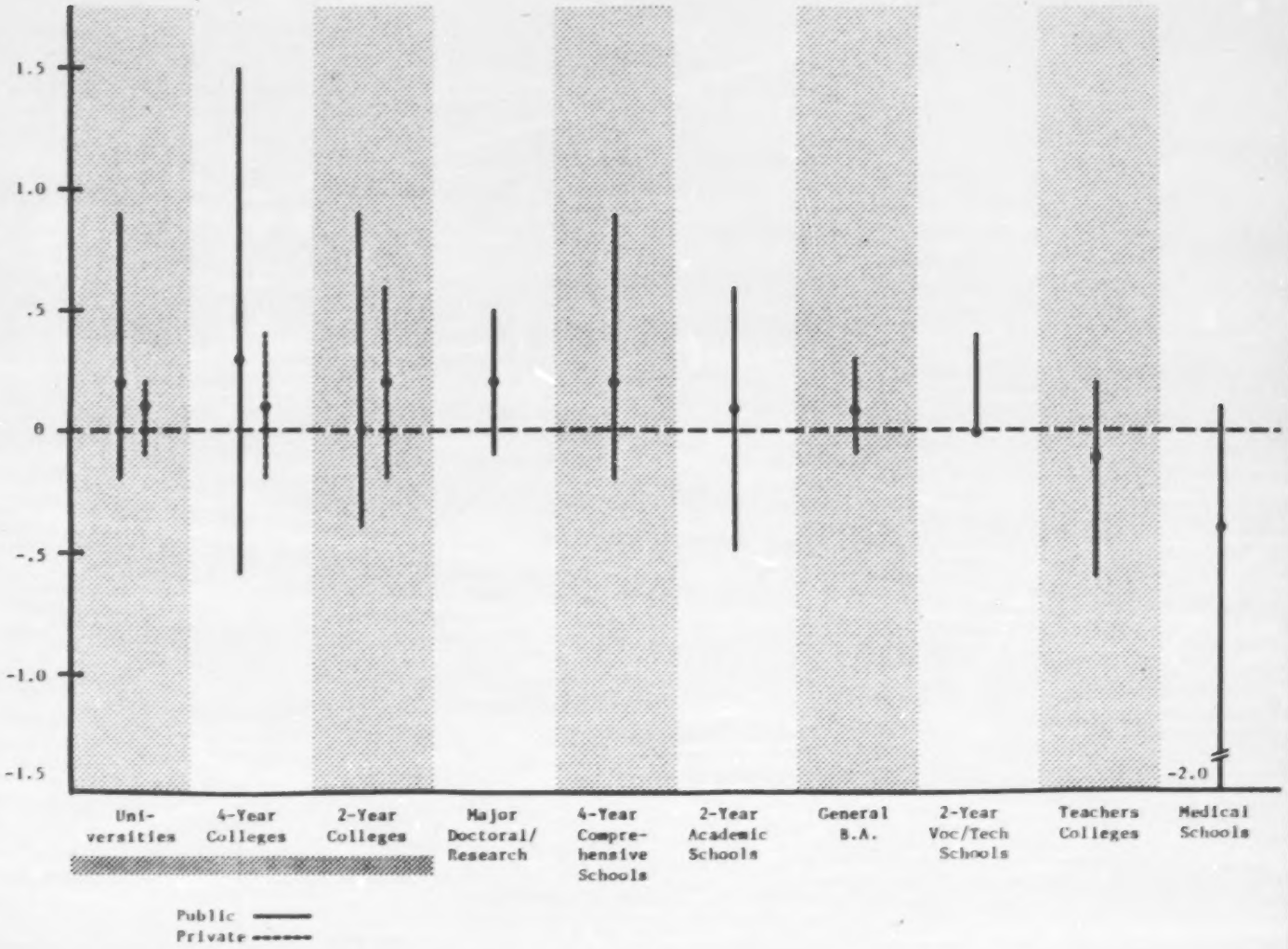

Figure 10. Changes in Net Tuition HEPVI values from 1976 to 1978 for the six institutional sectors and selected NCHEMS classifications: Medians and interquartile ranges.

colleges, and public two-year colleges. (Additional details concerning the development of DSCORE are contained in the appendix.)

To assess whether institutional status on one or more HEPVI measures can be related to institutional viability, correlations were calculated between these measures and the 1976-1978 DSCORES for institutions in the three sectors. Tables 3-5 present those correlation coefficients that were statistically significant at the .01, .001, and .0001 levels. Although only small percentages in the variances of DSCORE values are accounted for by the various HEPVI measures, consistent patterns in the relationships of HEPVI and DSCORE values can be observed.

For public and private two-year colleges, Tuition Rate HEPVI seems to be associated with institutional viability (Tables 3 and 5). Simply stated, the higher the market value of degrees awarded relative to the tuition rate the more viable the institution. The change form of this index complicates its relationship to viability for public two-year colleges, however. For these schools in 1978 (Table 5), an increase in the index from a previous year is associated with greater distress. One interpretation, which is admittedly speculative, is that the hastened efforts of public two-year colleges to increase the market values of their degree programs relative to tuition rates are actually the responses of these institutions to distress. Thus, while for any single year a higher value of Tuition Rate HEPVI suggests greater viability for public two-year colleges, sudden increases in Tuition Rate HEPVI may indicate quite the opposite condition--namely, that the college is trying to remedy its problems and become more viable.

In the case of private four-year colleges, the efficiency indexes (i.e., Faculty HEPVI, Instructional HEPVI, and Educational and General HEPVI) are consistently and positively related to viability for the years studied (Tables 3-5). It would appear that greater product value and lower operating expenses lead to greater institutional viability in this sector. Both the percentage change in Total HEPVI and the level of Mean HEPVI are also positively correlated with DSCORE for private four-year colleges (Tables 4 and 5), suggesting that the viability of these schools

Table 3

HEPVI Correlations with the 1976 Distress Scores
of Higher Education Institutions,
by Institutional Sector

Institutional Sector and Form of Indicator	N	τ	Probability (H_o:r=0)
Four-Year Private			
Faculty HEPVI: In 1976	769	.14	***
Educational and General HEPVI: In 1976	769	.15	***
Two-Year Private			
Tuition Rate HEPVI: In 1976	153	.29	***
Two-Year Public			
Tuition Rate HEPVI: In 1976	481	.13	*

* = probability ≤ .01
** = probability ≤ .001
*** = probability ≤ .0001

Table 4

HEPVI Correlations with the 1977 Distress Scores
of Higher Education Institutions,
by Institutional Sector

Institutional Sector and Form of Indicator	N	r	Probability (H_o:r=0)
Four-Year Private			
Total HEPVI:			
Change from 1976 to 1977	767	.15	***
Mean HEPVI:			
In 1977	767	.08	*
In 1976	767	.09	*
Faculty HEPVI:			
In 1977	755	.14	***
In 1976	762	.13	**
Instructional HEPVI:			
In 1977	767	.11	*
Educational and General HEPVI:			
In 1977	767	.16	***
In 1976	767	.12	**
Change from 1976 to 1977	767	.11	**

* = probability ≤ .01
** = probability ≤ .001
*** = probability ≤ .0001

Note: The change in Total HEPVI from 1976 to 1977 is calculated as the percentage change in the index over this period.

Table 5

HEPVI Correlations with the 1978 Distress Scores of Higher Education Institutions, by Institutional Sector

Institutional Sector and Form of Indicator	N	r	Probability (H_o:r=0)
Four-Year Private			
Total HEPVI:			
Change from 1977 to 1978	757	.10	*
Change from 1976 to 1978	757	.14	***
Mean HEPVI:			
In 1978	757	.10	*
In 1977	758	.09	*
Change from 1976 to 1978	757	.11	*
Faculty HEPVI:			
In 1978	738	.15	***
In 1977	744	.15	***
Instructional HEPVI:			
In 1978	757	.13	**
In 1977	757	.12	**
Educational and General HEPVI:			
In 1978	757	.20	***
In 1977	757	.17	***
Change from 1977 to 1978	756	.09	*
Change from 1976 to 1978	756	.11	*
Two-Year Private			
Tuition Rate HEPVI			
In 1978	138	.24	*
In 1977	139	.21	*
Two-Year Public			
Tuition Rate HEPVI:			
Change from 1977 to 1978	443	-.20	***
Change from 1976 to 1978	442	-.22	***

* = probability ≤ .01
** = probability ≤ .001
*** = probability ≤ .0001

Note: The changes in Total HEPVI from 1977 to 1978 and from 1976 to 1978 are calculated as the percentage changes in the index over these periods.

is related directly to the awarding of degrees in fields and at levels that can lead to higher-paying jobs.

Cautionary Note

The eight HEPVI measures discussed in the preceding pages are necessarily rather crude, owing to the fact that institutional reputation and discrepancies among the contents and requirements of degree programs offered by different institutions were not taken into account in their development. Two schools that offer the same types and numbers of degree programs, for example, may be differentially attractive to students if one is known to be especially highly regarded by the science or business community. Similarly, students may prefer to attend institutions that offer degrees in fields with many job opportunities but impose only minimal coursework requirements. For research purposes, the HEPVI measures serve as first-approximation indicators allowing, for example, the examination of the relationships between program offerings at institutions and the financial health of these institutions. However, HEPVI estimates are not suitable for evaluating or ranking individual institutions, although the measures when reported for types of institutions (e.g., medical schools) are relevant to the practices and policies of higher education.

TECHNICAL APPENDIX

Tables A-1 and A-2 present the medians and interquartile ranges for the static and change forms of the eight HEPVI measures introduced in the preceding discussion. These tables describe HEPVI values for the 17 major NCHEMS classifications. Table A-3 contains the starting-salary estimates, in 1980 dollars, that were used in deriving the eight HEPVI measures for universities and colleges in the six institutional sectors.

Refinements of Data Sources Used in Analysis

Data on degrees and other formal awards conferred by higher education institutions were obtained from HEGIS files for the years 1976-1978. A longitudinal data file was created, with the records for each school containing the degree data for these three years plus selected data from HEGIS financial and faculty surveys, the Longitudinal Enrollment File developed by the American Council on Education, and the NCHEMS file containing institutional classification codes based on 1976-1978 earned degree data. All data on the longitudinal file were printed out for schools that reported no degree awards in all major fields for a particular year. Three hundred eighty-five schools were identified by this means, and their data were scrutinized. In some cases, zeros in all degree areas were valid reports, since the school might have only opened the preceding year or have issued certificates of completion (which were not counted in reading the HEGIS files) rather than creditable degrees. For many of the cases where no degree awards were reported, however, examination of enrollment data and degree data for other years suggested that the numbers and types of degrees awarded were probably not reported in that year (rather than actually reported as zeroes), and consequently their values were set to missing. The records for schools known to have merged campus operations in each of the years 1976-1978 were combined. Seventy schools were involved in 28 such mergers, and their data were added together.

Out-of-range values for total numbers of degrees awarded by an institution were next considered. The data for schools reporting more degree awards than total student enrollment in a particular year or reporting an increase or decrease of a factor of three or more in degree awards from one year to the next were printed out and examined. Sixty-four schools were identified by this means, and 59 of these schools had unreasonable data for degree totals for specific major fields, which were set to missing. Schools with any missing degree data were not included in subsequent HEPVI analyses.

Development and Validation of a Composite Index of Distress (DSCORE)

The development of a composite index of distress, DSCORE, for each sector was accomplished in two steps. First, discriminant analyses were performed separately for the three sectors that had sufficient numbers of

colleges identified as being in distress in 1978. The only variables included in the analyses were those static and change indicators that had been found to be significantly related to distress in each sector in 1978. Second, the unstandardized discriminant coefficients were used to calculate a 1978 distress score, DSCORE78, for each college in the three sectors. DSCORE was designed to have a mean of zero within each sector, and the standard deviations are approximately one.

Because there were too few cases of distress to develop discriminant functions independently for two half-samples of the colleges in each sector and to cross-validate the discriminant functions, the utility of DSCORE was validated by applying the functions to data for previous years. Since some of the variables used to compute DSCORE78 were not available in comparable form for earlier years, the closest form of each variable to its form in the computation of DSCORE78 was used in calculating scores for the previous years (DSCORE76 and DSCORE77). Even with this compromise, DSCORE76 and DSCORE77 did identify most of the colleges known to be in distress in all three sectors in those years.

For more information, see: Gilmartin, K.J. Development of Indicators of the Viability of Higher Education Institutions, (Technical Report No. 19 of the Statistical Analysis Group in Education). Palo Alto, CA: American Institutes for Research, 1981.

Table A-1

Medians (M) and Interquartile Ranges (R) for HEPVI Values in 1978, by NCHEMS Classifications

NCHEMS Classifications	Total* HEPVI		Mean* HEPVI		Student* HEPVI		Tuition Rate HEPVI		Faculty* HEPVI		Instructional HEPVI		E&G HEPVI		Net Tuition HEPVI	
	M	R	M	R	M	R	M	R	M	R	M	R	M	R	M	R
Major Doctoral/ Research	$65,129 (N=78)	$50,953	$16.6 (N=78)	$1.8	$4.0 (N=78)	$1.2	14.2 (N=78)	13.8	$76.0 (N=12)	$15.2	1.5 (N=78)	.6	.5 (N=78)	.2	4.4 (N=78)	3.9
Major Doctoral/ Nonresearch	$41,415 (N=94)	$29,063	$15.6 (N=94)	$1.9	$4.0 (N=94)	$1.2	12.5 (N=94)	13.2	$84.6 (N=40)	$37.1	1.9 (N=94)	.8	.8 (N=94)	.5	3.4 (N=94)	3.9
Four-Year Comprehensive Schools	$14,883 (N=385)	$14,213	$14.4 (N=385)	$1.7	$3.4 (N=385)	$1.4	15.2 (N=385)	17.9	$66.8 (N=356)	$30.9	2.2 (N=385)	.9	1.0 (N=385)	.5	4.0 (N=385)	4.6
General B.A.	$2,619 (N=737)	$2,845	$13.2 (N=737)	$1.5	$2.7 (N=736)	$1.0	5.8 (N=735)	3.2	$44.2 (N=718)	$22.0	1.9 (N=735)	.9	.7 (N=736)	.4	1.5 (N=736)	1.1
Divinity Schools	$393 (N=216)	$496	$10.2 (N=216)	$2.0	$2.2 (N=216)	$1.8	7.2 (N=215)	4.1	$39.8 (N=193)	$29.6	1.5 (N=216)	1.3	.5 (N=216)	.4	2.3 (N=215)	3.0
U.S. Service Schools	$12,080 (N=9)	$13,802	$18.4 (N=9)	$3.0	$3.7 (N=8)	$.8	-- (N=0)	--	$57.4 (N=5)	$66.2	1.1 (N=9)	1.1	.2 (N=9)	.3	-- (N=0)	--
Medical Schools	$7,211 (N=50)	$6,746	$25.4 (N=50)	$12.9	$7.5 (N=50)	$1.8	14.2 (N=49)	15.4	$84.2 (N=10)	$62.5	.6 (N=50)	.5	.3 (N=50)	.3	3.8 (N=49)	8.1
Other Health Professional Schools	$2,828 (N=33)	$2,424	$19.7 (N=33)	$4.0	$4.8 (N=33)	$3.5	6.2 (N=32)	1.7	$93.3 (N=27)	$105.4	2.8 (N=33)	2.7	1.2 (N=33)	.9	1.6 (N=32)	.8
Engineering Schools	$2,830 (N=39)	$5,427	$18.6 (N=39)	$6.6	$4.1 (N=39)	$1.7	9.1 (N=37)	12.3	$70.3 (N=35)	$27.3	2.4 (N=39)	1.4	.9 (N=39)	.7	2.4 (N=37)	4.0
Business Schools	$2,794 (N=47)	$3,859	$13.6 (N=46)	$5.0	$3.3 (N=47)	$2.0	6.6 (N=46)	3.7	$105.8 (N=35)	$99.0	4.2 (N=47)	4.1	1.4 (N=47)	1.5	1.7 (N=47)	1.5
Fine Arts Schools	$934 (N=48)	$1,737	$11.0 (N=48)	$.7	$1.9 (N=48)	$1.6	4.3 (N=47)	2.1	$32.9 (N=47)	$41.0	1.1 (N=48)	.7	.4 (N=48)	.4	.9 (N=47)	.6
Law Schools	$5,390 (N=19)	$3,932	$22.0 (N=19)	$1.0	$7.1 (N=19)	$2.5	7.8 (N=19)	2.7	$325.6 (N=16)	$133.2	5.8 (N=19)	1.9	2.2 (N=19)	.7	2.7 (N=19)	1.1
Teachers Colleges	$1,821 (N=52)	$4,702	$11.5 (N=52)	$2.9	$2.6 (N=52)	$2.1	7.6 (N=52)	12.2	$49.8 (N=49)	$40.0	1.8 (N=52)	1.4	.7 (N=52)	.6	1.9 (N=52)	2.7
Other Specialized Schools	$256 (N=44)	$288	$13.0 (N=44)	$5.4	$2.4 (N=44)	$2.1	8.3 (N=41)	8.8	$23.5 (N=30)	$61.3	1.5 (N=44)	2.4	.5 (N=44)	.7	1.7 (N=41)	1.4

* Values reported in thousands of dollars.

Table A-1 (continued)

NCHEMS Classifications	Total* HEPVI M	Total* HEPVI R	Mean* HEPVI M	Mean* HEPVI R	Student* HEPVI M	Student* HEPVI R	Tuition Rate HEPVI M	Tuition Rate HEPVI R	Faculty* HEPVI M	Faculty* HEPVI R	Instructional HEPVI M	Instructional HEPVI R	E&G HEPVI M	E&G HEPVI R	Net Tuition HEPVI M	Net Tuition HEPVI R
Two-Year Voc/ Tech Schools	$330 (N=342)	$1,020	$9.0 (N=231)	$2.0	$.3 (N=340)	$1.8	11.4 (N=229)	15.3	$7.1 (N=327)	$37.1	.2 (N=342)	1.7	.1 (N=342)	.7	.6 (N=342)	1.7
Two-Year Comprehensive Schools	$1,400 (N=637)	$1,994	$8.0 (N=635)	$.5	$.8 (N=637)	$.8	20.4 (N=633)	18.7	$22.3 (N=631)	$20.3	.7 (N=637)	.8	.4 (N=637)	.4	2.3 (N=635)	3.1
Two-Year Academic Schools	$528 (N=131)	$696	$8.0 (N=130)	$0.0	$1.6 (N=131)	$1.0	7.3 (N=130)	11.6	$33.2 (N=121)	$28.5	1.6 (N=131)	1.4	.6 (N=131)	.3	1.8 (N=131)	1.9

* Values reported in thousands of dollars.

Table A-2

Medians (M) and Interquartile Ranges (R) for Changes in HEPVI Values from 1976 to 1978, by NCHEMS Classifications

NCHEMS Classifications	Total* HEPVI		Mean** HEPVI		Student** HEPVI		Tuition Rate HEPVI		Faculty** HEPVI		Instructional HEPVI		E&G HEPVI		Net Tuition HEPVI	
	M	R	M	R	M	R	M	R	M	R	M	R	M	R	M	R
Major Doctoral/ Research	+12.9% (N=78)	13.2%	+$.2 (N=78)	$.3	+$.4 (N=78)	$.6	-.2 (N=78)	1.2	+$11.2 (N=11)	$21.8	+.1 (N=78)	.2	±0.0 (N=78)	.1	+.2 (N=78)	.6
Major Doctoral/ Nonresearch	+10.8% (N=94)	18.0%	+$.2 (N=94)	$.4	+$.3 (N=94)	$.7	-.2 (N=94)	1.2	+$9.5 (N=40)	$14.8	+.1 (N=94)	.4	±0.0 (N=94)	.1	+.2 (N=94)	1.0
Four-Year Comprehensive Schools	+10.4% (N=384)	24.0%	+$.2 (N=384)	$.4	+$.3 (N=384)	$.8	0.0 (N=383)	1.9	+$4.9 (N=344)	$16.1	+.1 (N=383)	.5	+ .1 (N=383)	.2	+.2 (N=383)	1.1
General B.A.	+11.0% (N=729)	30.9%	+$.2 (N=729)	$.6	+$.2 (N=729)	$.7	0.0 (N=726)	.8	+$3.3 (N=697)	$13.5	+.2 (N=723)	.5	±0.0 (N=726)	.2	+.1 (N=726)	.4
Divinity Schools	+16.2% (N=202)	72.6%	±$0.0 (N=202)	$.3	+$.3 (N=202)	$1.1	-.5 (N=201)	2.2	+$6.7 (N=158)	$22.3	+.2 (N=201)	.8	±0.0 (N=202)	.3	+.1 (N=201)	1.4
U.S. Service Schools	+19.4% (N=8)	31.1%	±$0.0 (N=8)	$.4	+$.7 (N=7)	$.7	-- (N=0)	--	+$38.8 (N=4)	$32.5	+.1 (N=8)	.3	+.1 (N=8)	.2	-- (N=0)	--
Medical Schools	+14.9% (N=47)	30.4%	±$0.0 (N-47)	$1.4	+$.5 (N=47)	$.8	-1.3 (N=45)	4.7	-$34.8 (N=7)	$246.5	±0.0 (N=47)	.2	±0.0 (N=47)	.1	-.4 (N=45)	2.1
Other Health Professional Schools	+45.4% (N=31)	59.4%	±$0.0 (N=31)	$.4	+$.6 (N=31)	$1.8	-.7 (N=30)	1.2	+$10.4 (N=25)	$36.4	+.4 (N=31)	1.2	+.1 (N=31)	.4	+.3 (N=30)	.6
Engineering Schools	+11.5% (N=39)	43.9%	±$0.0 (N=39)	$.7	+$.3 (N=39)	$1.0	-.3 (N=37)	2.8	+$8.4 (N=28)	$14.9	+.1 (N=39)	1.0	±0.0 (N=39)	.2	-.1 (N=37)	1.3
Business Schools	+29.7% (N=42)	58.7%	±$0.0 (N=41)	$1.1	+$.7 (N=42)	$1.3	-.1 (N=40)	1.2	+$15.8 (N=30)	$62.5	+1.1 (N=41)	2.6	+.2 (N=41)	.6	+.3 (N=41)	1.1
Fine Arts Schools	+15.4% (N=47)	35.7%	±$0.0 (N=47)	$.3	+$.2 (N=47)	$.6	-.1 (N=46)	.5	+$2.9 (N=43)	$14.7	+.1 (N=47)	.4	±0.0 (N=47)	.2	+0.0 (N=46)	.3
Law Schools	+14.5% (N=15)	32.5%	±$0.0 (N=15)	$0.0	+$.8 (N=15)	$.8	-1.0 (N=15)	2.3	+$4.4 (N=10)	$73.1	-.1 (N=15)	1.9	+.1 (N=15)	.7	+.1 (N=15)	1.1
Teachers Colleges	+4.0% (N=50)	30.1%	+$.1 (N=50)	$.5	+$.1 (N=50)	$.7	-.1 (N=50)	1.2	+$.1 (N=45)	$20.0	±0.0 (N=50)	.4	±0.0 (N=50)	.2	-.1 (N=50)	.8
Other Specialized Schools	±0.0% (N=37)	58.0%	±$0.0 (N=37)	$.9	+$.1 (N=37)	$1.6	-.3 (N=34)	2.7	-$4.3 (N=17)	$36.6	+.2 (N=37)	1.6	±0.0 (N=37)	.5	±0.0 (N=34)	1.0

* The change in Total HEPVI from 1976 to 1978 is calculated as the percentage change in the index over this period.

** Values reported in thousands of dollars.

Table A-2 (continued)

NCHEMS Classifications	Total* HEPVI M	Total* HEPVI R	Mean** HEPVI M	Mean** HEPVI R	Student** HEPVI M	Student** HEPVI R	Tuition Rate HEPVI M	Tuition Rate HEPVI R	Faculty** HEPVI M	Faculty** HEPVI R	Instructional HEPVI M	Instructional HEPVI R	E&G HEPVI M	E&G HEPVI R	Net Tuition HEPVI M	Net Tuition HEPVI R
Two-Year Voc/ Tech Schools	+21.6% (N=189)	72.6%	±$0.0 (N=175)	$.1	±$0.0 (N=293)	$.3	-.3 (N=175)	2.8	±$0.0 (N=276)	$4.1	±0.0 (N=293)	.3	±0.0 (N=293)	.1	±0.0 (N=293)	.4
Two-Year Comprehensive Schools	+12.2% (N=621)	50.1%	±$0.0 (N=621)	$.1	+$.1 (N=623)	$.4	-.2 (N=617)	4.8	+$1.2 (N=613)	$8.8	±0.0 (N=623)	.3	±0.0 (N=623)	.1	+.1 (N=619)	1.5
Two-Year Academic Schools	+8.1% (N=121)	49.8%	±$0.0 (N=120)	$0.0	+$.1 (N=121)	$.7	-.1 (N=120)	1.2	+$1.3 (N=104)	$9.9	+.1 (N=121)	.6	±0.0 (N=121)	.2	+.1 (N=121)	1.1

* The change in Total HEPVI from 1976 to 1978 is calculated as the percentage change in the index over this period.

** Values reported in thousands of dollars.

Table A-3

Estimates of Starting Salaries for 67 Major Fields,
in 1980 Dollars

Major Field of Study	Estimate of Starting Salary
Dentistry	$26,000
Medicine	35,000
Optometry	22,000
Osteopathy	35,000
Pharmacy	20,000
Podiatry	28,000
Veterinary Medicine	24,000
Chiropractic Medicine	20,000
Law	22,000
Theology	10,000
Other Professional	24,000
Agriculture and Natural Resources	
B.A.	$14,000
M.A.	16,000
Ph.D.	20,000
Architecture and Environmental Design	
B.A.	$15,000
M.A.	18,000
Ph.D.	22,000
Area Studies	
B.A.	$11,000
M.A.	13,000
Ph.D.	16,000
Biological Sciences	
B.A.	$14,000
M.A.	18,000
Ph.D.	22,000
Business and Management	
B.A.	$16,000
M.A.	22,000
Ph.D.	28,000
Communications	
B.A.	$14,000
M.A.	19,000
Ph.D.	23,000

Table A-3 (continued)

Major Field of Study	Estimate of Starting Salary
Computer and Information Sciences	
B.A.	$19,000
M.A.	24,000
Ph.D.	30,000
Education	
B.A.	$ 9,000
M.A.	15,000
Ph.D.	19,000
Engineering, General	
B.A.	$20,000
M.A.	23,000
Ph.D.	29,000
Aerospace, Aeronautical Engineering	
B.A.	$21,000
M.A.	24,000
Ph.D.	30,000
Agricultural Engineering	
B.A.	$20,000
M.A.	23,000
Ph.D.	29,000
Architectural Engineering	
B.A.	$20,000
M.A.	23,000
Ph.D.	29,000
Bioengineering, Biomedical Engineering	
B.A.	$20,000
M.A.	23,000
Ph.D.	29,000
Chemical Engineering (inc. Petroleum Refining)	
B.A.	$24,000
M.A.	26,000
Ph.D.	31,000
Petroleum Engineering	
B.A.	$26,000
M.A.	29,000
Ph.D.	36,000
Civil, Construction Engineering	
B.A.	$20,000
M.A.	23,000
Ph.D.	29,000

Table A-3 (continued)

Major Field of Study	Estimate of Starting Salary
Electrical, Communications Engineering	
B.A.	$22,000
M.A.	25,000
Ph.D.	32,000
Mechanical Engineering	
B.A.	$22,000
M.A.	25,000
Ph.D.	32,000
Geological Engineering	
B.A.	$23,000
M.A.	26,000
Ph.D.	32,000
Geophysical Engineering	
B.A.	$23,000
M.A.	26,000
Ph.D.	32,000
Industrial, Management Engineering	
B.A.	$22,000
M.A.	24,000
Ph.D.	30,000
Metallurgical Engineering	
B.A.	$23,000
M.A.	25,000
Ph.D.	30,000
Materials Engineering	
B.A.	$23,000
M.A.	25,000
Ph.D.	30,000
Ceramic Engineering	
B.A.	$23,000
M.A.	25,000
Ph.D.	30,000
Textile Engineering	
B.A.	$23,000
M.A.	25,000
Ph.D.	30,000
Mining, Mineral Engineering	
B.A.	$23,000
M.A.	25,000
Ph.D.	30,000

Table A-3 (continued)

Major Field of Study	Estimate of Starting Salary
Engineering Physics	
B.A.	$22,000
M.A.	24,000
Ph.D.	30,000
Nuclear Engineering	
B.A.	$22,000
M.A.	24,000
Ph.D.	30,000
Engineering Mechanics	
B.A.	$22,000
M.A.	24,000
Ph.D.	30,000
Environmental, Sanitary Engineering	
B.A.	$20,000
M.A.	23,000
Ph.D.	29,000
Naval Architecture and Marine Engineering	
B.A.	$20,000
M.A.	23,000
Ph.D.	29.000
Ocean Engineering	
B.A.	$20,000
M.A.	23,000
Ph.D.	29,000
Engineering Technologies	
B.A.	$21,000
M.A.	23,000
Ph.D.	28,000
Engineering, Other	
B.A.	$20,000
M.A.	23,000
Ph.D.	29,000
Fine and Applied Arts	
B.A.	$11,000
M.A.	13,000
Ph.D.	16,000
Foreign Languages	
B.A.	$11,000
M.A.	13,000
Ph.D.	16,000

Table A-3 (continued)

Major Field of Study	Estimate of Starting Salary
Health Professions	
B.A.	$16,000
M.A.	19,000
Ph.D.	25,000
Home Economics	
B.A.	$14,000
M.A.	17,000
Ph.D.	20,000
Legal Studies	
B.A.	$15,000
M.A.	17,000
Ph.D.	19,000
English, Philosophy, Classics	
B.A.	$13,000
M.A.	17,000
Ph.D.	18,000
Library Science	
B.A.	$ 9,000
M.A.	13,000
Ph.D.	18,000
Mathematics	
B.A.	$18,000
M.A.	21,000
Ph.D.	29,000
Military Sciences	
B.A.	$15,000
M.A.	19,000
Ph.D.	26,000
Physical Sciences	
B.A.	$21,000
M.A.	24,000
Ph.D.	29.000
Psychology	
B.A.	$13,000
M.A.	16,000
Ph.D.	20,000
Public Affairs and Services	
B.A.	$15,000
M.A.	17,000
Ph.D.	22,000

Table A-3 (continued)

Major Field of Study	Estimate of Starting Salary
Social Sciences	
B.A.	$13,000
M.A.	16,000
Ph.D.	20,000
Theological Studies	
B.A.	$ 9,000
M.A.	12,000
Ph.D.	15,000
Interdisciplinary Studies	
B.A.	$16,000
M.A.	19,000
Ph.D.	24,000
Arts and Science, General	
A.A. and Other, Two-Year Degree (OT)	$ 8,000
Data Processing Technologies	
A.A. and OT	$13,000
Health Services and Paramedical Technologies	
A.A. and OT	$ 8,000
Mechanical and Engineering Technologies	
A.A. and OT	$10,000
Natural Science Technologies	
A.A. and OT	$ 9,000
Business and Commerce Technologies	
A.A. and OT	$10,000
Public Service-Related Technologies	
A.A. and OT	$ 8,000